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Multicolor Direct Flocking in the US

Part II

Flocking

Editor's note:

In our April issue, Brown Abrams provided an overview of the flock market, explaining the options and opportunities that are available to screen printers. In this second part of the series, Mr. Abrams introduces multicolor direct flocking. It is an expensive process, requiring major capital investments (as much as $150,000). However, the future of multicolor flocking is not limited to the imprinted garment market and should instead be seen as a potential industrial process as well.

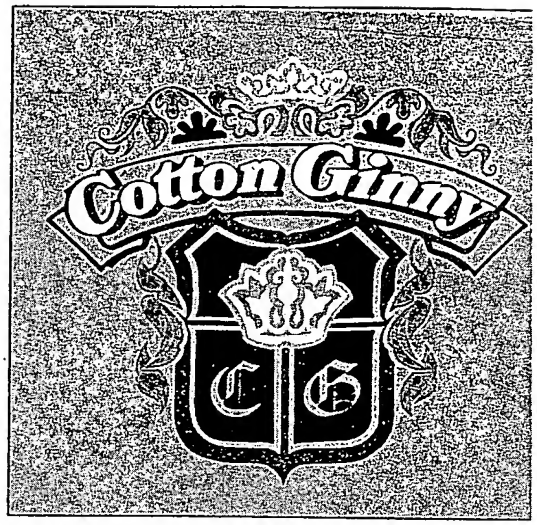

Photo courtesy of Cotton Ginny (Toronto, Canada)

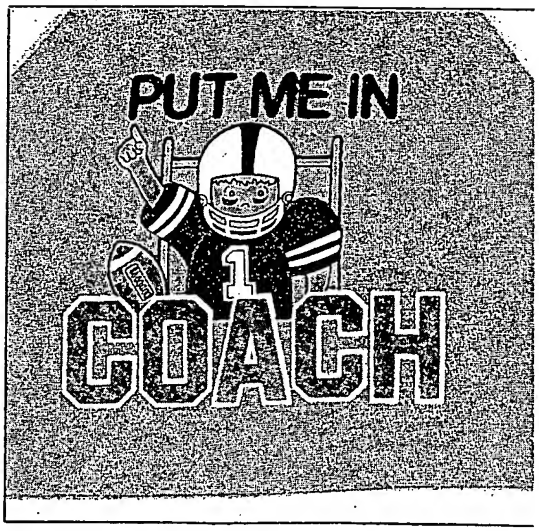

Photo courtesy of L. Davis Textiles Co., Ltd. (Toronto, Canada)

Brown Abrams
Fiberlok, Inc.

THERE is nothing new about flocked apparel. It has been around for decades. But if you think about it, the flocked image is usually a single color on a sweatshirt—nothing fancy. In most cases, this image has been flocked directly onto the garment using the *beater-bar* or *gravity* method of flocking. Today, there is another alternative: *multicolor-direct-electrostatic flocking* (MCF).

Most screen printers have always considered beater-bar and gravity flocking to be messy and often ineffective processes. This is because they have

- ***Poor fiber alignment:*** The fibers fall at many angles in relation to the substrate, resulting in a fuzzy or blurry appearance of the design.
- ***Uneven flock density:*** Because it is difficult to control the evenness of the falling fibers, there are visible variations in the shading.
- ***Questionable durability:*** The degree of penetration of the flock fiber into the screen-printed adhesive is uncontrollable, leading to poorly affixed fibers and reduced washability.

Multicolor-direct-electrostatic flocking, on the other hand, overcomes these undesirable features and offers excellent flock alignment, even color across the image, more luxurious "hand," and greatly enhanced durability.

Wh re we've been:
Origins of the process

1974

In the US, the techniques for commercial applications of multicolor-direct-electrostatic flocking were first developed for the doormat market by Ernie Mumpower. Mumpower received the US patent for the process (No. 3,793,050), which was subsequently sold to Leon Schwartz, owner of Indoor Billboard Corp. (Charlotte, NC). Indoor Billboard was the first US firm to make commercial use of the process, pioneering the market for doormats.

1980

Indoor Billboard licensed the Devon Corp. (Chattanooga, TN) to use the MCF process for making similar products for the advertising-specialty market, including change mats for store checkout counters and "Rug Mugs" (coasters).

1983

Maag & Schenk GmbH (Reutlingen, West Germany) introduced the first automatic machine in the US that allowed continuous and simultaneous application of adhesive as well as all the different flock colors by one machine. Previously, the MCF process was performed by screen printing adhesive onto the substrate and then placing the substrate, by hand, into separate flocking machines (each of which contained a different color flock).

1986

Mr. Schwartz sold Indoor Billboard to Ludlow Composites Corp., except for the MCF patent. Ludlow was then licensed by Indoor Billboard to use the patented process. Later in that year, the patent was sold to Maag & Schenk.

1987

At the time of this writing, Devon Corp. and Ludow Composites are using the MCF process, primarily for the manufacture of doormats, change mats, and coasters. These firms do not yet use the fully automatic equipment.

Licensees using the automatic MCF process for the decoration of apparel products in the US include Russell Corp. (Alexander City, AL), Champion Products (Rochester, NY), and IDEA (Caldwell, ID). Two Canadian companies, Davis Textiles and Creative Cresting Ltd. (both in Toronto), are also producing multicolor direct-flocked apparel.

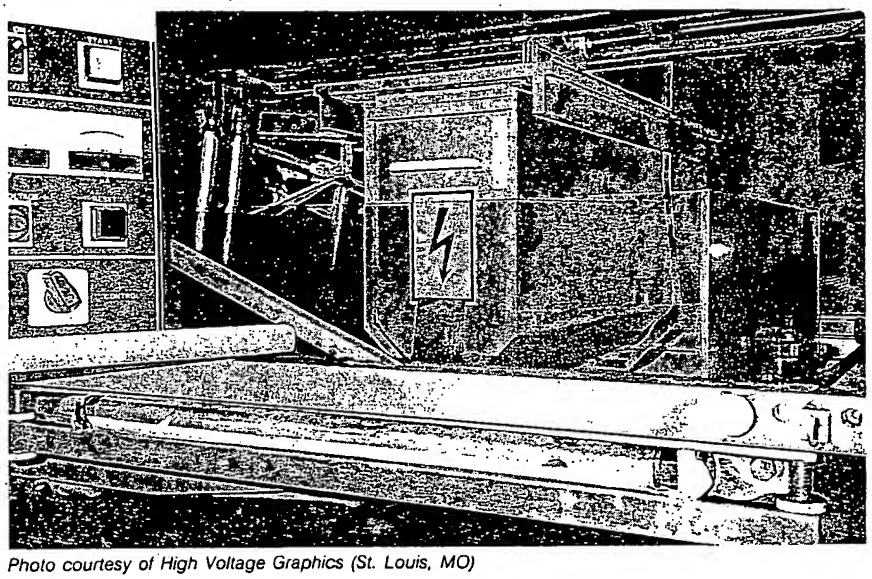

Photo courtesy of High Voltage Graphics (St. Louis, MO)

The process

Automatic MCF equipment is similar to rotary-load, multicolor garment-printing machines, except that only the first station is for printing (the adhesive). All subsequent stations are for flock application or loading and unloading the garment. A flocking station consists of

1. an aluminum platen that serves as the ground;
2. an imaged screen, as you would use for printing any ink;
3. an acrylic flock-containment box that sits inside the screen frame (open at the top and bottom);
4. a dosing box that dispenses the flock into the electrostatic field; and
5. a high-voltage generator that creates the electrostatic field.

During the flocking process, the dosing box dispenses the flock into the electrostatic field. The process is almost like salt falling from a shaker, except that there is a brushing action through a screen at the bottom of the dosing box to keep the fibers falling at a consistent rate. The flock fibers are charged by an electrode located inside the dosing box, or by charging the dosing screen. When the flock is released into the charged electrostatic field, it travels toward the aluminum platen, attracted by the opposite electrical charge. The flock then either penetrates the open image area and sticks into the adhesive, or changes its charge when it gets to the nonimage portion of the screen and heads back up toward the electrode. The flock fiber will continue to "oscillate" in the field until it either situates itself in the adhesive or falls outside the field.

After flocking, the substrate is either racked for air drying or loaded onto a conveyor for drying and curing the adhesive. The final step is vacuuming or cleaning the excess flock from the design.

An extended learning curve or "shake-down period" has been reported by all the firms using automatic MCF equipment because of the idiosyncracies of the multicolor direct-flocking process. Despite considerable experience in screen printing, each user has had to control the new variables introduced by flock. These variables include

- ***Artwork preparation:*** When art is prepared for MCF, the registration overlap must be manipulated more than for traditional direct screen printing. Dark color overlap may need to be increased when butting a significantly lighter color, while two lighter colors may require minimal overlap. The conductivity of the adhesive, humidity conditions, the type of flock, and the color position within the entire image may also affect the need for this variable. It is necessary to experiment with art preparation to determine specific requirements.

- ***Adhesive:*** Electrostatic flocking requires an adhesive that conducts electricity, so traditional plastisols are usually not acceptable. A number of companies are using water-based acrylic adhesives, although proprietary flock-adhesive products for use with MCF are available. Controlling the adhesive deposit and viscosity is also more important with MCF because the finished flock density and overall image "hand" are affected by varying thicknesses of adhesive and the ability of the flock to penetrate it.

• ***Position of the scr ens:*** The parallel relationship between the screen and the substrate, as well as the distance between the two, is a great deal more critical than in screen printing. If the screen is positioned too high, the flock fibers will spray out from under the screen, contaminating nonimage areas. If the screen is too low, the flock may pull back out of the adhesive and plug the screen.

• ***Flock dose:*** The rate and amount of flock released into the electric field must be carefully controlled. A variety of flock-fiber types and lengths are available, each of which may require different dosing conditions or controls.

• ***Level of voltage:*** The maximum voltage possible is suggested without shorting or arcing the system.

• ***Climate control:*** The operation should be located in a separate area of the shop, both to keep the potentially contaminating flock away from other production areas and to maintain the constant climate control needed for electrostatic flocking. Generally, a relative humidity of 65-70% is considered optimal.

Changes in any of these variables can dramatically affect the quality of the finished flocked image.

The materials

Since the MCF process is new in the US, domestic suppliers of flock and chemicals have not yet developed products specifically designed for this market. Consequently, most supplies were originally imported from Europe along with the process itself. The technology and research in flocking still tends to be more advanced overseas. For example, European flock tends to be more "electrically active" (conductive), so it generally shoots faster and with greater velocity at the same voltage level than flock available from US producers. More electrically active flock means higher production levels and greater control over the process.

Both rayon and nylon flock are being used in the MCF process. Polyester and acrylic flock are also starting to come into use as more variations are developed

Further information on MCF is available from:

Maag & Schenk GmbH
Ferdinand-Lassalle Str. 24
D-7410 Reutlingen 11
West Germany
Tel: 7121-64064

High Voltage Graphics, Inc.
PO Box 5
St. Louis, MO 63166
Tel: (314) 231-7444

that better lend themselves to certain MCF applications. In addition to the flock type, the MCF user must also consider flock length, denier, and finish (satin, semi-dull, dull, or super-dull). The choice of flock is important because it can influence

• appearance of the finished flock design (detail of image, opacity, and brilliance);

• hand (feel) of the image area;

• speed or efficiency of the flocking process, including both the conductivity of the flock and the straightness of the flock as it passes through the imaged screen; and

• durability of the finished product (nylon can be industrially cleaned, rayon cannot).

Where we are going

Apparel products decorated with MCF graphics are becoming more popular as they are gradually introduced to the US market. The most visible items currently decorated with MCF graphics include major-league sports items, college garb, and individually licensed images. The rate of growth for MCF-decorated products is limited only by the rate at which (1) the technology can be introduced, (2) the producers can learn successful processing techniques, and (3) screen printers or manufacturers can justify the relatively high investment cost (approximately $150,000).

Equally exciting are the as-yet unexploited possibilities for other products and substrates. Thus far, consumer decoratives on garments and mats have been the primary flocked products. However, the durable MCF images do lend themselves to the industrial clothing and uniform markets as well. We have seen the process applied to vinyl, for example, resulting in a stunning contrast of textures. This not only opens the doors for binder decoration, but also for pressure sensitives. Polyester film, paper, board, and acrylic offer interesting flocking opportunities as well for the P-O-P and exhibit markets. Flock provides a texture unavailable with standard decorating procedures.

Multicolor direct-electrostatic flocking should be seen as another potential process for screen printers. The concept is young but maturing gradually, and as more firms gain experience and open new markets, the equipment technology and available supplies will expand to fill the growing need. ■